

Appendix B

Water Quality Program Programmatic Actions

Action Strategies To Address Parameters of Concern

Action strategies have been developed to address water quality problems in the Delta and its tributaries. The strategies are recommended actions to reduce parameter loadings from the sources of water quality problems (e.g., mine drainage, agricultural drainage, urban and industrial runoff, and municipal and industrial wastewater treatment facilities), to improve source water quality; to upgrade water treatment plants, to identify and remove toxic substances, or to improve water management practices.

Individual programmatic actions may vary in cost, technical complexity, and other respects that would affect the final choices for implementation of actions. Actions will therefore be subjected to pre-feasibility analysis to determine which programmatic actions are most appropriate to be carried forward toward implementation. This work will begin in Phase II of the CALFED program, and will continue into Phase III. Full feasibility analysis in conjunction with project-specific environmental documentation will be performed in Phase III.

Programmatic water quality actions can be generally categorized as source control, treatment, or water management. Following are the actions recommended by the Water Quality Common Program, along with performance measures and indicators of success. More detailed information on the expected benefits and constraints associated with these actions can be found in the Water Quality Common Program Plan.

Mine Drainage

Action

Reduce toxic effects of cadmium, copper, and zinc loadings to the Delta and its tributaries by source control or treatment of mine drainage at inactive and abandoned mine sites. Action targeted at the Upper Sacramento River and tributaries to the Upper Sacramento River that are major contributors of copper, cadmium and zinc loadings.

- Source control methods include capping tailings piles, removing tailings piles, diverting water courses from metal sources, sealing mines, removing contaminated sediments, and similar measures to prevent metals from leaching or draining into water bodies.
- Treatment methods involve collecting and treating mine drainage to remove metals and neutralize acidity.

Timing of releases is an existing tool.

Reduction in copper concentrations in upper Sacramento River
to meet Basin Plan objectives. *document*

Performance measure

- Reduction in annual copper loadings (during an average water year) to the Upper Sacramento River from approximately 65,000 pounds to 10,000 pounds.

Indicator of success

Achievement of Basin Plan objectives for cadmium, copper and zinc in the Sacramento River above Hamilton City.

Action

Reduce toxic effects of mercury loadings to the Delta and its tributaries from source control and/or treatment of mine drainage at inactive and abandoned mines.

Methods

- Development of a system-wide research program to identify bioavailable mercury, sources of the bioavailable forms and an action plan to reduce loadings of these forms to the Delta and its tributaries.
- Development of pilot scale projects to determine feasibility of mercury contaminated sediment cleanup. Recommend action be targeted at Cache Creek and its tributary watersheds.
- Treatment of mercury contaminated mine effluents. Recommend action be targeted at the Cache Creek Watershed and Mt. Diablo mine.

Performance measures

- Improved understanding of sources and mechanisms of mercury bioaccumulation in the Delta.
- Improved understanding of the cost/benefit associated with remediation of mercury contaminated sediment.
- A targeted action plan for specific selection and prioritization of actions to remediate mercury loadings to the Delta and its tributaries.
- Reduction in mercury loadings to Cache Creek.

Indicator of success

- Achievement of US EPA guideline for mercury in the Delta and its tributaries.
- Removal of health advisories.

Urban and Industrial runoff

Action

Reduce toxic effects of copper, zinc and cadmium loadings to the Delta and its tributaries from urban and industrial runoff

- Enforcement of existing source control regulations.
- Provision of incentives for additional source control of urban and industrial runoff, particularly those areas that have runoff associated with vehicle usage.

Performance measure

- Improved understanding of the sources and mechanisms for bioaccumulation of cadmium,

copper, and zinc in the Delta.

- Reduction in copper loadings at selected stormwater monitoring stations.

Indicator of success

- For copper and zinc achievement of Basin Plan objectives in the Delta and Sacramento River and its tributaries, US EPA 304(a) guidelines in the San Joaquin River and its tributaries
- For cadmium achievement of Basin Plan objectives in the Sacramento River and its tributaries and west of Antioch Bridge in the Delta, US EPA 304(a) guidelines in the San Joaquin River and its tributaries and east of Antioch Bridge in the Delta.

Action

See For comments.

Reduce toxicity from the pesticides chlorpyrifos and diazinon in the Delta and its tributaries through source control of urban and industrial runoff.

Methods

- Enforcement of existing source control regulations
- Provision of source control incentives, such as public education for homeowners on pesticide usage and incentives for pesticide users to implement implementation of best management practices including integrated pest management

Performance measure

- Improved understanding of the toxicity and mechanisms of chlorpyrifos and diazinon transport into the Delta.
- Reduced toxicity at selected stormwater monitoring stations measured by improved survivability from a three-species test.

Indicator of success

- Reduced toxicity from chlorpyrifos and diazinon in the Delta and its tributaries.

Action

Reduce the effects of nutrient loadings and consequently, oxygen depletion in the Delta and its tributaries through source control of urban and industrial runoff.

Methods

- Enforcement of existing source control regulations including implementation of best management practices
- Provision of incentives for additional source control including best management practices and better planning of new developments (e.g., design of storm drainage systems that target maximum infiltration of stormwater into the ground or on-site or regional stormwater sedimentation facilities that detain the majority of stormwater for at least 8 hours, etc.) and public education.

Performance measure

- Improved understanding of the sources and mechanisms for nutrient transport in the Delta.
- No measurable impacts to fish from low dissolved oxygen levels in the Lower San Joaquin River.

Indicator of Success

- Achievement of Basin Plan objectives for dissolved oxygen in the Delta and its tributaries, particularly in the Lower San Joaquin River.

Action

Reduce the impacts of sediment loading, and subsequent turbidity to the ecosystem of the Delta and its tributaries and to urban drinking water sources in the Delta, through source control of urban and industrial runoff.

Methods

- Better enforcement of existing source control regulations for construction sites. May include development of ordinances and other measures.
- Education of construction personnel on impacts of construction site discharge.

Performance Measure

- Decreased turbidity levels at Delta water supply intakes.
- Increased juvenile anadromous fish production in areas of new developments on Delta tributaries where anadromous fish are known to spawn.

Indicator of Success

- Achievement of a 50 NTU monthly median turbidity in drinking water intakes.
- Achievement of Basin Plan objectives for turbidity.

Wastewater and Industrial Discharges**Action**

Reduce the impact of domestic wastes and human pathogens to Delta urban drinking water supplies and recreational water use, and boat discharges within the Delta and Delta tributaries.

Note: The Delta has 24,000 registered boats and 80 marinas. Bacterial pollution from one boat is equivalent to the effluent of 10,000 people whose sewage passes through a treatment plant. Regulatory standards do not currently exist to measure achievement of environmental target.

Methods

- More extensive enforcement of boat domestic waste discharge regulations.
- Extensive boater education campaigns.
- Installation of more extensive, better, and more economical pumpout stations.
- Installation of more public toilet facilities.

Performance Measure

- Quantitative records from pumpout facilities that show increased usage by boaters. Usage should match expected boater domestic waste quantities.
- Number of public workshops and other outreach activities.
- Number of new pumpout and toilet facilities installed.

Indicator of Success

- Reduced bacteriological counts in marinas and other recreational areas.

- Lower pathogen levels near water supply intakes.

Action

Reduce the toxic impacts of oxygen depleting substances and copper and mercury loadings to the Delta through cost effective source control and treatment of industrial and municipal wastewater discharges. Action for oxygen depleting substances should be targeted at the Lower San Joaquin River and copper and mercury loadings at the Suisun Bay and Carquinez Straight area.

Methods

- Increased incentives for industries to pre-treat discharges containing copper and mercury.
- Incentives for municipal wastewater effluent reclamation and reuse.
- Treatment of a portion of upstream municipal wastewater effluent in wetlands.

Performance Measures

- Reduction in nutrient loadings from Delta municipal wastewater treatment facilities.
- Reduction in copper and mercury loadings from Delta wastewater treatment plants.

Indicator of Success

- Achievement of Basin Plan objectives for oxygen in the Lower San Joaquin River.
- Achievement of applicable Basin Plan objectives for EPA 304(a) criteria for copper and mercury in the Delta.

Action

Reduce the toxic impacts of selenium loadings to the Delta through source control and treatment of industrial discharges. Action should be targeted at industries that discharge selenium to the Suisun Bay and Carquinez Straight area.

Method

- Additional treatment of industrial discharges in the western Delta for selenium removal.

Performance Measure

- Reduction in selenium loadings to the western Delta

Indicator of Success

- Reduced tissue burden of selenium in aquatic organisms of the western Delta.

Agricultural Drainage

Reduce the effects of selenium loadings to the Lower San Joaquin River and Delta by controlling sources of selenium in agricultural sub-surface drainage.

Methods

- Change use of lands that are major sources of selenium through voluntary landowner participation and by compensated arrangements to reduce drainage volumes.

- Reduce drainage flows through increased water use efficiency.
- Treat drainage for selenium removal.

Performance Measure

- Reduced selenium loadings from the Grassland area of the San Joaquin River watershed.

Indicator of Success

- Reduced selenium concentrations in the San Joaquin River near Vernalis, where the River flows into the Delta.

Note: Crow Landing is the Board's compliance monitoring point on the river and should be used in lieu of Vernalis.

Action

Without other sources of salt (other than ag.)
 Reduce salinity impacts to Delta urban and agricultural source water quality through source control and treatment of agricultural surface and sub-surface drainage in the San Joaquin River watershed.

Methods

- Improved source irrigation water quality in sub-surface drainage areas.
 - Concentration and safe disposal of agricultural drainage in evaporation ponds.
 - Treatment of agricultural drainage by reverse osmosis, constructed wetlands, or by other means.
 - Time agricultural drainage discharges to coincide with periods when dilution flow is sufficient to achieve water quality target ranges for salinity.
- Add out of Basin export*
do wetlands remove salt?

Performance Measures

- Reduced salinity loads entering the San Joaquin River and adjacent lands.

Indicators of Success

- Reduced salinity in the San Joaquin River near Vernalis, where the River flows into the Delta.

Action

Reduce salinity for agricultural source water in the South Delta through improved outflow patterns and water diversion in the Delta.

Methods

- Construct tide gates, weirs, dams or sills at the head of Old River and possibly other southern Delta channels to manage drainage flows, tidal currents and stages in the San Joaquin and Middle Rivers and interconnecting channels.
- Relocate Delta island drainage to more efficiently route salinity to the Bay and ocean.
- Provide dilution water for salinity control. (This measure would be considered as one possible means of mitigating salinity impacts of other CALFED actions, if such mitigation were necessary.)

Performance Measures

- Reduced salinity loads entering southern Delta channels.

Indicators of Success

- Reduced total dissolved solids in the southern reaches of the Old and Middle Rivers.

This could cause salt problems for San Joaquin River.

Action

Reduce the toxic effects of carbofuran, chlorpyrifos, and diazinon in the Delta and its tributaries through source control of agricultural surface drainage and Delta island drainage.

Method

- Incentives and/or enforcement of existing regulations. *Revise and enforce regulations as necessary.*
- Incentives for pesticide users to increase implementation of best management practices including integrated pest management and grower education.

Performance Measures

- Reduction of toxicity in Delta channel waters.

Indicator of Success

- Improved survival of test organisms in three-species toxicity bioassays, and indications through the toxicity identification evaluation testing that pesticides are not a significant cause of toxicity in Delta channels.
- Achievement of Basin Plan objectives for carbofuran when they are promulgated.

Action

Reduce the toxic effects of ammonia entering the Delta and its tributaries through source control of agricultural surface drainage.

Method

- Provide incentives for implementation of best management practices at dairies, other animal operations, and fertilized lands in the watersheds that discharge into the Delta, including the North Bay, and the lower reaches of the Sacramento and San Joaquin Rivers, and westside stream tributaries to the Delta.

Performance Measures

- Reduced toxicity due to ammonia in Delta channels and lower reaches of its tributary streams.

Indicator of Success

- Improved survival of test organisms in three-species toxicity bioassays, and indications through the toxicity identification evaluation testing that ammonia is not a significant cause of toxicity in Delta channels.
- Achievement of CWA 304(a) guidelines for ammonia in the Delta and its tributaries.

Action

Reduce the toxic effects of ammonia entering the Delta and its tributaries from waste water treatment plant discharge through improved treatment.

- Incentives for improved waste water treatment facilities and processes.

Performance Measure

- Reduced toxicity due to ammonia in Delta channels and lower reaches of its tributary streams.

Indicator of Success

- Improved survival of test organisms in three-species toxicity bioassays, and indications

What data shows that this is a Delta problem?

through the toxicity identification evaluation testing that ammonia is not a significant cause of toxicity in Delta channels.

Water Treatment

Action

Improve treated drinking water quality (including reduction in formation of disinfection by-products) through treatment to reduce concentrations of total organic carbon, pathogens, turbidity, and bromides.

Methods

- Incentives for the addition of enhanced coagulation, ozone, granular activated carbon filtration and/or membrane filtration facilities to water systems treating water from the Delta.

Performance Measures

- Reliably meet current and future drinking water standards.

Indicator of Success

- Absence of waterborne disease outbreaks and quantitative evidence of treatment success by measures such as bacteria counts, pathogen counts, and measurements of organic carbon, disinfection byproducts, and turbidity.

Action

Improve total organic carbon, pathogens, turbidity and bromides at domestic water supply intakes.

Method

- Relocate water supply intakes to areas not influenced by those discharges.

Performance Targets

- Total organic carbon concentrations 3.0 mg/L (quarterly average).
- Bromide concentration 100 mg/L (quarterly average).
- Turbidity 1 NTU or equivalent NTU (monthly median).
- Total dissolved solids less than 20 mg/L (10 year average), or less than 440 mg/L (monthly average).
- Protozoa (Giardia, Cryptosporidium oocysts) less than 1 oocyst/100 L (annual average).

Indicators of Success

- Existing modern, well operated treatment plants can successfully and reliably meet current and future drinking water standards without the need to significantly upgrade facilities.
- Absence of waterborne disease outbreaks and quantitative evidence of treatment success by measures such as bacteria counts, pathogen counts, and measurements of organic carbon, disinfection byproducts, and turbidity.

What about source control from Delta Islands and other sources?

Unknown Toxicity

Action

Identify and implement actions to address potential (toxicity to water and sediment) within the Delta and its tributaries.

bad English!

Method

- Conducting toxicity testing and toxicity identification evaluations and/or other appropriate methods.
- Coordinate efforts with monitoring programs being conducted by

Performance Measure

- Numbers of toxicity bioassays and Toxicity Identification Evaluation tests conducted.

Indicator of Success

- Successful identifications of causal agents of toxicity in the channels of the Delta estuary.

Water Management

Action

Reduce the concentration of salinity entering the Delta from its tributaries during low flow periods.

Methods

- Acquiring dilution water from willing sellers.
- Provision of incentives for more efficient water management of dams, including reservoir re-operation.
- Urban water conservation. Conservation might be achieved through use of incentives for implementation of water management practices by more suppliers and water users. Implementation of conservation may reduce demand for existing water and may make dilution water available (including transfers), especially on the San Joaquin River.
- Creation of reclaimed wastewater (e.g., recharge groundwater, treated agricultural drainage water, agricultural irrigation, recycling and treating for potable or non-potable urban use, and storage for use in meeting X2 standards). Reclamation programs would focus on facilities that currently discharge treated wastewater to salt sinks or other degraded bodies of water that are not reusable.
- Enhanced seasonal recharge.
- Development of additional groundwater supplies.

Performance Target

Reduced salinity loads to the Delta.

Indicator of Success

- Reduced concentrations of total dissolved solids, chloride, and bromide in the San Joaquin River near Vernalis, where the River flows into the Delta.